

S/N 10/004,567

Page 3

CISCO-4758

**AMENDMENT(S) TO THE CLAIMS:**

The following listing of claims will replace all prior versions, and listings, of claims on the application. All claims are set forth below with one of the following annotations.

- (Original): Claim filed with the application.
  - (Currently amended): Claim being amended in the current amendment paper.
  - (Canceled): Claim cancelled or deleted from the application. No claim text is shown.
  - (Withdrawn): Claim still in the application, but in a non-elected status.
  - (New): Claim being added in the current amendment paper.
  - (Previously presented): Claim added or amended in an earlier amendment paper.
  - (Not entered): Claim presented in a previous amendment, but not entered or whose entry status unknown. No claim text is shown.
1. (Currently amended) An apparatus Apparatus for transmitting an OFDM signal, said apparatus comprising:
- a transform block that converts a group of subcarriers of an OFDM symbol to a set of time domain samples of said OFDM symbol to form a time domain burst; and
- a frequency domain mapping block that assigns modulated subcarriers of said group to subchannels of said OFDM symbol so that said transform block outputs a time domain digital signal positioned at an ~~IF~~ intermediate frequency (IF), and that adjusts values of subcarriers of said group of subcarriers so that said samples of said OFDM symbol have strictly real values,
- such that there are a total of N values for N positive and negative frequency subchannels to be converted to the set of real-valued time domain samples,
- wherein the transform block includes a preprocessor to map the series of N values to a first series of <sup>N/2-point Complex-valued Series</sup> ~~N/2 values~~ using a first mapping function, an n/2-point transformer to perform an inverse discrete Fourier transform on said first

S/N 10/004,567

Page 4

CISCO-4758

N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and a postprocessor to map real and imaginary components of said second N/2-point complex-valued series to the set of real-valued time domain samples using a second mapping function.

2. Cancelled.
3. (Original) The apparatus of claim 1 further comprising a cyclic prefix block that adds a cyclic prefix to said time domain burst.
4. (Currently amended) The apparatus of claim 3 further comprising:  
a digital to analog converter that generates an analog signal derived from an output ~~output~~ of said transform block without time domain digital filtering.
5. (Currently amended) An apparatus ~~Apparatus~~ for receiving an OFDM signal, said apparatus comprising:  
a cyclic prefix removal block to remove a cyclic prefix from samples of a received time domain OFDM signal to provide a series of N received time domain samples;  
a transform block that converts the series of N received time domain samples to a frequency domain OFDM symbol comprising a set of complex valued subcarriers; and  
a frequency domain symbol processing block that selects subcarriers of said frequency domain OFDM symbol centered at an ~~IF~~ intermediate frequency (IF) as baseband frequency domain symbols, thereby frequency shifting said selected subcarriers to baseband,  
wherein the series of N received time domain samples are real-valued, and wherein the transform block includes a preprocessor to map the series of N received time domain samples to a first series of <sup>N/2-point</sup> ~~N/2~~ values using a first mapping function, a transformer to perform an FFT on said first N/2-point series to obtain a second N/2-point series of values; and a postprocessor to

S/N 10/004,567

Page 5

CISCO-4758

<sup>second</sup> <sup>series</sup>  
map the N/2-point set of values to a total of N real and imaginary valued subcarriers at a corresponding set of N frequency subchannels, including the selected subcarriers to be shifted to baseband, the postprocessor using a second mapping function.

6. Cancelled.

7. (Original) The apparatus of claim 5 further comprising:

an analog to digital converter that converts an IF analog signal to provide said time domain samples without time domain digital filtering.

8. (Currently amended) The apparatus of claim 7 ~~claim 5~~ wherein said analog to digital converter ~~over samples~~ oversamples said analog signal.

9. (Currently amended) A method for transmitting an OFDM signal, said method comprising:

assigning subcarriers to subchannels centered around an IF intermediate frequency (IF) within an <sup>a</sup> ~~OFDM~~ <sup>OFDM</sup> frequency domain symbol to implement a frequency shift to that IF such that there are a total of N values for N positive and negative frequency subchannels;

converting said N values for N subchannels of the frequency domain OFDM symbol to real-valued time domain samples; <sup>set of</sup> ~~the converting of~~ including:

<sup>N/2-point complex-valued</sup>  
mapping the N values to a first series of N/2 values using a first mapping function;

performing an N/2-point inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to a set of real-valued time domain samples using a second mapping function; and

S/N 10/004,567

Page 6

CISCO-4758

transmitting a signal based on said real-valued time domain samples.

10. <sup>(Currently amended)</sup>  
~~(Original)~~ The method of claim 9 further comprising:  
<sup>real-valued</sup>  
generating an analog signal based on said time domain samples without time domain digital filtering.

11. (Currently amended) A method of using an N/2-point transform to transform an N-point ~~a N-point~~ complex-valued series to an N-point real-valued series, said method comprising:

mapping said N-point complex-valued series to a first N/2-point complex-valued series using a first mapping function;

performing an inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to said N-point real-valued series using a second mapping function.

12. (Currently amended) The method of claim 11 wherein said first mapping function comprises:

$$R(A) = [X_r(A) - X_r(B)] * \sin A + [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$R(B) = [X_r(B) - X_r(A)] * \sin A - [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$I(A) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A - X_i(A) + X_i(B)$$

$$I(B) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A + X_i(A) - X_i(B)$$

wherein  $A + B = N$ ,  $R(m)$  is a real component of an  $m$ th point of said first N/2-point complex-valued series,  $I(m)$  is an imaginary component of said  $m$ th point;  $X_r(p)$  is a real component of a  $p$ th point of said N-point ~~N-point~~ complex-valued series, and  $X_i(p)$  is an imaginary component of said  $p$ th point.

S/N 10/004,567

Page 7

CISCO-4758

13. (Currently amended) The method of claim 11 wherein said second mapping function comprises:

$x(2k) = y_r(k)$ ,  $x(2k+1) = y_i(k)$  wherein  $x(p)$  is a real-only value of a  $p$ th component of said N-point real-valued series,  $y_r(k)$  is a real component of a  $k$ th complex point of said second N/2-point ~~N/2~~ complex-valued series, and  $y_i(k)$  is an imaginary component of said  $k$ th complex point.

14. (Currently amended) A method for receiving an OFDM signal, said method comprising:

converting a series of N real-valued time domain samples of a received OFDM signal to a frequency domain OFDM symbol using ~~a transform~~ <sup>transformer</sup> an N/2-point transform, including:

mapping the series of N real-valued time domain samples to a first  
<sup>N/2-point</sup> series of ~~N/2~~ values using a first mapping function;

transforming the first series <sup>N/2-point series of values</sup> using the N/2-point transformer to  
perform an FFT on said first N/2-point series <sup>of values</sup> to obtain a second N/2-point series of values; and

mapping the <sup>second</sup> N/2-point series of values to a total of N real and  
imaginary valued subcarriers at a corresponding set of N frequency  
subchannels using a second mapping function; and

selecting subcarriers from said frequency <sup>OFDM</sup> domain symbol to effect a frequency  
shift from an IF intermediate frequency (IF) to baseband.

15. (Cancelled).

16. <sup>(Currently amended)</sup> ~~(Original)~~ The method of claim 14 further comprising:

converting an IF analog signal to a digital signal used to generate said <sup>real-valued</sup> time domain samples without time domain digital filtering.

S/N 10/004,567

Page 8

CISCO-4758

17. (Currently amended) The method of claim 16 ~~claim 15~~ wherein converting comprises oversampling said IF analog signal.

18. (Currently amended) An apparatus ~~Apparatus~~ for transmitting an OFDM signal, said apparatus comprising:

means for assigning subcarriers to subchannels centered around an ~~IF~~ intermediate frequency (IF) within an ~~OFDM frequency~~ a frequency domain OFDM symbol to implement a frequency shift to that IF such that there are a total of N values for N positive and negative frequency subchannels;

means for converting said N values for N subchannels of the frequency domain OFDM symbol to real-valued time domain samples; the means for converting ~~of~~ including:

means for mapping the N values to a first series of <sup>*N/2-point complex-valued*</sup> N/2 values using a first mapping function;

means for performing an N/2-point inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

means for mapping real and imaginary components of said second N/2-point complex-valued series to a set of real-valued time domain samples using a second mapping function; and

means for transmitting a signal based on <sup>*real-valued*</sup> said time domain samples.

19. (Currently amended) An apparatus ~~Apparatus~~ for receiving an OFDM signal, said apparatus comprising:

means for converting a series of N real-valued time domain samples of a received OFDM signal to a frequency domain OFDM symbol using a a <sup>*transformer*</sup> transform ~~an N/2-point transform~~, the means for converting including:

S/N 10/004,567

Page 9

CISCO-4758

first mapping means for mapping the series of N real-valued time domain samples to a first series of <sup>N/2-point</sup> ~~N/2~~ values using a first mapping function;

means for transforming the first <sup>N/2-point series of values</sup> ~~series~~ using the N/2-point transformer to perform an FFT on said first N/2-point <sup>of values</sup> ~~series~~ to obtain a second N/2-point series of values; and

second means for mapping the second N/2-point series of values to a total of N real and imaginary valued subcarriers at a corresponding set of N frequency subchannels using a second mapping function; and

means for selecting subcarriers from said frequency domain OFDM symbol to effect a frequency shift from an IF intermediate frequency (IF) to baseband.

20. (Currently amended) A computer program product for transmitting an OFDM signal, said computer program product comprising:

code that assigns subcarriers to subchannels centered around an IF intermediate frequency (IF) within a frequency domain OFDM symbol to implement a frequency shift to that IF such that there are a total of N values for N positive and negative frequency subchannels;

code that converts said N values for N subchannels of the frequency domain OFDM symbol to real-valued time domain samples, including code for:

mapping the N <sup>N/2-point</sup> ~~values~~ to a first series of ~~N/2~~ values using a first mapping function;

performing an N/2-point inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to a set of real-valued time domain samples using a second mapping function; and

S/N 10/004,567

Page 10

CISCO-4758

code that ~~causes a transmitter to transmit~~ transmit a signal based on said real-valued time domain samples; and

a computer-readable storage medium that stores the codes.

21. (Cancelled).

22. (Currently amended) A computer program product for using an N/2-point to transform N-point complex-valued series to an N-point real-valued series, said computer program product comprising:

code that maps said N-point complex-valued series to a first N/2-point complex-valued series using a first mapping function;

code that performs an inverse fast Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point ~~N/2~~ complex-valued series;

code that maps real and imaginary components of said second N/2-point complex-valued series to the N-point complex-valued ~~real-valued~~ series using a second mapping function; and

a computer readable storage medium that stores the codes.

23. (Currently amended) The computer program product of claim 22 wherein said first mapping function comprises:

$$R(A) = [X_r(A) - X_r(B)] * \sin A + [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$R(B) = [X_r(B) - X_r(A)] * \sin A - [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$I(A) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A - X_i(A) + X_i(B)$$

$$I(B) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A + X_i(A) - X_i(B)$$

wherein  $A + B = N$ ,  $R(m)$  is a real component of an  $m$ th point of said first N/2-point complex-valued series,  $I(m)$  is an imaginary component of said  $m$ th



S/N 10/004,567

Page 11

CISCO-4758

point;  $X_r(p)$  is a real component of a  $p$ th point of said ~~N-point~~ ~~N-point~~ complex-valued series, and  $X_i(p)$  is an imaginary component of said  $p$ th point.

24. (Currently amended) A computer program product for receiving an OFDM signal, said computer program product comprising:

code that converts a series of N real-valued time domain samples of a received OFDM signal to a frequency domain OFDM symbol using a ~~transform~~ <sup>transformer</sup> ~~an N/2-point transform~~, the code that converts including code for:

<sup>N/2-point</sup> ~~transform~~ mapping the series of N real-valued time domain samples to a first series of ~~N/2~~ <sup>N/2-point series of values</sup> values using a first mapping function;

<sup>N/2-point series of values</sup> transforming the first series using the N/2-point transformer to perform an FFT on said first N/2-point series <sup>of values</sup> to obtain a second N/2-point series of values; and

<sup>second</sup> mapping the N/2-point series of values to a total of N real and imaginary valued subcarriers at a corresponding set of N frequency subchannels using a second mapping function;

code that selects subcarriers from said frequency domain OFDM symbol to effect a frequency shift from an ~~IF~~ intermediate frequency (IF) to baseband; and

a computer-readable storage medium that stores the code that converts and the code that selects.

25. (Cancelled)